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Sicydium from the Dominican Republic with Description of a New Species (Teleostei: Gobiidae)

By Ronald E. Watson, Gainesville, Florida

With 16 figures and 4 tables

Summary

Species of the sicydiine gobiid fish genus *Sicydium* are described from the Dominican Republic. Four species are recognized: the stone biting goby species *Sicydium buscki* and *S. plumieri,* and the algae eating goby species *S. gilberti* **n.sp.** and *S. punctatum.* The stone biting species have a feeding habit of scraping algae from rock surfaces, while the algae eating species are feeding on filamentous algae and other soft vegetation. All four species can be recognized by unique upper jaw dentition which is related to the feeding habits. A key for the identification of the species is presented. The new species *S. gilberti* is characterized by having its upper jaw teeth distinctly trident-like in a single row with anterior aspect of each tooth facing outwards, having a side by side appearance; belly fully scaled in adults; scales in zigzag series usually 18–20 (range 14–22).

Keywords: Gobiidae; *Sicydium;* Dominican Republic; new species; tooth morphology.

Zusammenfassung

Die Gattung *Sicydium* (Grundeln, Familie Gobiidae, Unterfamilie Sicydiinae) umfasst vier Arten in der Dominikanischen Republik: *Sicydium buscki* und *S. plumieri,* die Algen von Steinen abweiden, sowie *S. gilberti* **n.sp.** und *S. punctatum,* die filamentöse Algen und andere weiche Pflanzen abzupfen. Alle vier Arten sind durch die Morphologie ihrer Oberkieferzähne charakterisiert, die verschiedene Ernährungsweisen reflektiert. Die vier Arten werden in einem Bestimmungsschlüssel unterschieden. Die neue Art *S. gilberti* ist durch ihre dreizackigen Oberkieferzähne charakterisiert, die in einer einzigen Reihe Seite an Seite stehen, so dass der anteriore Teil jedes Zahns nach außen zeigt; durch den bei Adulttieren voll beschuppten Bauch; und durch die Schuppenanzahl (in einer Zickzackserie gezählt) meist 18–20 (selten 14–22).

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1. Introduction

In May 1994 I was informed of a large collection of *Sicydium* Valenciennes, 1837 from the Dominican Republic housed at the Staatliches Museum für Naturkunde in Stuttgart, Germany (Fricke, pers. comm.). The entire collection, approximately 450 specimens, was shipped to me a short time later with all specimens identified as *Sicydium vincente* Jordan & Evermann, 1898. What was originally thought to be a simple and straight forward task, based on information that only one species was present on Puerto Rico (Hildebrand, 1935; Erdman, 1961, 1986), turned into nearly four years of study resulting in the identification of four species.

Sicydium, like other gobioid genera, has had a confused and chaotic systematic history, with most classical works having more taxonomic validity than many modern works. *Sicydium is* restricted to swift, high gradient rainforest streams, that usually enter directly into the sea. *Sicydium* is found throughout western and eastern Middle America, extending from Sinaloa, Mexico to Peru along the Pacific, including Coco Island, Costa Rica, and from Veracruz, Mexico to the Rio Orinoco, Venezuela. *Sicydium* also occurs commonly on high islands of the Greater and Lesser Antilles of the Caribbean Sea, to include Trinidad and Tobago, and in West Africa it is known from Côte d'Ivoire to the Congo. *Sicydium* is the only sicydiine genus with species commonly found in continental drainages, though there are exceptions in other genera.

Sicydium is an entirely herbivorous genus that consumes vegetable matter, mostly algae (Erdman, 1961, 1986), and not omnivorous as stated in Parenti & Maciolek (1993). As a result of dietary requirements species of *Sicydium* have evolved different upper jaw dentition, to crop various types of algae. Species from the Dominican Republic are *Sicydium buscki* Evermann & Clark, 1906, *S. gilberti* **n.sp.,** *S. plumieri* (Bloch, 1786), and *S. punctatum* Perugia, 1896. All four species from the Dominican Republic can be distinguished on the basis of upper jaw dentition alone. Differences in upper jaw teeth cannot be attributed to developmental stages or age of animals, because teeth are consistently of one type in juveniles and adults.

Upper jaw tooth morphology in sicydiine gobies has received little attention in most modern literature, and has never been considered as a phylogenetic tool. Some historical works contain illustrations (Ogilvie-Grant, 1884; Hora in Annandale & Hora 1925; Herre, 1927, 1936), and a few discuss specific morphology (Jordan & Eigenmann, 1887; Jordan & Evermann, 1898; Regan, 1914). The number,

arrangement and morphology of upper teeth are critical in the diagnoses of all sicydiine gobies. Dental characteristics remain identifiable and useful even if a specimen dries out. Failure to recognize the critical nature of dental characteristics, both morphology and arrangement, resulted in types for *Sicydium crenilabrum* Harrison, 1993 from West Africa to be designated belonging to two genera.

Cephalic sensory pore patterns and cutaneous sensory papillae are useful in identifying species and sometimes genera. In this study two species usually have preopercular canal pores M and O, but pore N may be present, similarities exist in other sicydiine genera (personal observation). Pore patterns may be present or absent in a single genus (Lachner & McKinney, 1978, 1979) or vary considerably in a single species (Watson & Lachner, 1985), making it too plastic to be considered an effective phylogenetic tool.

Teeth show a high degree of morphological stability and different species may have morphologically identical teeth. This occurs in *S. plumieri* and *S. cocoense* (Heller & Snodgrass, 1903), but with further comparison differences in squamation and preopercular pore pattern can be demonstrated. Teeth used in feeding and the digestive tract are considered primary in their evolution, with all other adaptive characteristics secondary.

Brockmann (1965) stated tooth structure to possibly be a useful character in separating species within *Sicydium,* but failed to elaborate. Though spending a great deal of time cutting sections of upper jaws in a variety of specimens, including some types, Brockmann (1965) failed to recognize a second species from the Pacific slope of Panama, which remains undetermined. Brockmann (1965) also placed most sicydiine genera in synonymy with *Sicydium* based on the presence of canine teeth in the lower jaw. Because lower jaw teeth are used in agonistic behavior and not for feeding, they are considered to be of little taxonomic value.

Harrison (1993) stated differences in upper jaw dentition in West African sicydiines to be the result of 'differential wear'. *Sicydium* species from the Dominican Republic have different upper jaw teeth, and without serious analysis all four species have and still are identified as one species (Hildebrand, 1935; Erdman, 1961, 1986). *Sicydium plumieri* (with two rows of teeth) and *S. buscki* (with one) have roughly unicuspid teeth which are adapted for rasping algae from rock surfaces and named here 'stone biting gobies.' *Sicydium gilberti* **n.sp.,** and *S. punctatum* have tricuspid upper jaw teeth that are used to shear off lengths of filamentous algae and more delicate vegetation and are named here 'algae eating gobies.' In no case, even of the approximately 2,000 specimens of sicydiine gobies examined, could 'differential wear' be attributed to differences in tooth morphology. The only wear that could be detected were fractures between cusps of tricuspid teeth attributed to cropping filamentous algae, especially noticeable in species belonging to the genus *Sicyopterus* Gill, 1860 in the Indo-Pacific, and the distal wear of unicuspid teeth scraping algae from rock surfaces.

Though examination of teeth in the upper jaw of adult *Sicydium* is useful in identifying species, it remains problematic in post larval fry and early juveniles. Post larval fry and early juveniles examined have tricuspid upper jaw teeth, but I have not studied upper jaw tooth morphology adequately in material this small. *Sicydium cocoense* is the only species known from Coco Island, Costa Rica. Post larval fry and early juveniles of *S. cocoensis* have tricuspid teeth, but adults have teeth identical to those found in *S. plumieri.*

The nature of teeth may be the only element that can be used in palaeontological research of sicydiine gobies. Soft tissue rarely fossilizes, and sicydiine gobies are very poor candidates for fossilization due to their habitat preference. Scanning electron microscopy employed in this study shows tooth morphology to be distinctive in the four species recognized from the Dominican Republic.

The purpose of this paper is to present the description of four species of *Sicydium* from the Dominican Republic and to establish a dental record for each.

2. Methods, materials and acknowledgments

2.1. Methods

All counts and measurements follow those of WATSON (1995). Counts of scales and pectoral rays taken from the right side. Proportional measurements utilized in tabular data expressed to the nearest whole percent of standard length and all measurements accomplished using dial calipers taken to the nearest 0.1 mm.

Abbreviations used to represent pores in the cephalic sensory pore system follow AKIHITO (1986). Abbreviations used in the descriptive account follow WATSON (1995), with few additions: *A,* anal fin. *C,* caudal fin, only counts of branched rays reported as unbranched rays may be confused with posterior procurrent rays, especially in small specimens. *D* dorsal fin. *D1* first dorsal fin. *D2,* second dorsal fin. *LS,* scales in lateral series, counted from upper pectoral base, or anteriormost scale along lateral midline, to central hypural base. *P,* pectoral fin. *PD,* predorsal midline, counted from scale directly anterior to first dorsal fin insertion to anteriormost scale. *TRB,* transverse series back, refers to scales counted from first scale anterior to second dorsal fin, in a diagonal manner, posteriorly and ventrally to anal fin base. *TRF,* transverse series forward, refers to scales counted from first scale anterior to second dorsal fin, in a diagonal manner, anteriorly and ventrally to center of belly or ventralmost scale. *ZZ,* zigzag series, refers to scales on narrowest region of caudal peduncle counted from uppermost scale to lowermost scale in a zigzag (alternating) manner. Micrometer is abbreviated as *µm.*

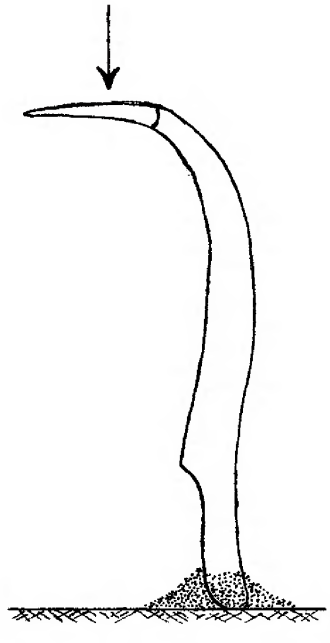


Fig. 1. Upper jaw tooth of *Sicydium. Arrow* indicates surface of tooth photographed.

MOCHUZUKI et alii (1991) identified three rows of upper jaw teeth in *S. plumieri* as rows *HR, F* and *OF1.* Through a dissecting microscope HR and F are visible and in this study considered as two rows, OF1 is mostly or entirely below the gum and no longer visible. All counts of teeth taken from the right side of symphysis, only the outer row (HR) is counted in *S. plumieri.* Teeth always curve sharply at a near right angle from the root and this exposed upper surface is considered the anterior aspect of each tooth (Fig. 1). Photographed teeth were taken from the primary row which are considered mature teeth, the root stock was mounted on a metal stock using a silver based adhesive. All mounted teeth were placed in a vacuum chamber and coated with a 1.4 µm layer of platinum using a high voltage charge. Digital scanning microscopy was accomplished on a Zeiss DSM950 located in the Zoology Department at the University Regensburg, Federal Republic of Germany. The background in all photographs of teeth are regions of the metal stock that the teeth are glued to.

Key to species identification based largely on upper jaw dentition. Selected counts and measurements of the Dominican Republic *Sicydium* species are compared in Tabs. 1–4.

2.2. Materials

Specimens examined are deposited at the following institutions:

ANSP	The Academy of Natural Sciences of Philadelphia, U.S.A.;
BMNH	Natural History Museum, London, Great Britain [formerly British Museum (Natural History)];
FMNH	Field Museum of Natural History, Chicago, U.S.A.;
INP.ENSAT	Institut National Polytechnique, Ecole Nationale Supérieure Agronomique de Toulouse, France;
MHNG	Muséum d'Histoire Naturelle, Genève, Switzerland;
MSNG	Museo Civico di Storia Naturale "Giacomo Doria", Genova, Italy;
NTM	Northern Territory Museum of Arts and Sciences, Darwin, Australia;
SMF	Naturmuseum und Forschungsinstitut Senckenberg, Frankfurt/Main, Germany;
SMNS	Staatliches Museum für Naturkunde in Stuttgart, Germany;
UF	Florida Museum of Natural History, University of Florida, Gainesville, Florida, USA;
USNM	National Museum of Natural History, Smithsonian Institution, Washington D.C., U.S.A.

2.3. Acknowledgments

I wish to thank the following. For loan of material: S. MULLER (MHNG); H. K. LARSON (NTM); R. FRICKE (SMNS); G. H. BURGESS (UF). For donating specimens: P. DE RHAM (Lausanne, Switzerland) and H. HORSTHEMKE (Witten, Germany). For introducing me to the staff in the Zoology Department: B. KRAMER (University Regensburg, Germany); allowing me access to digital scanning equipment: J. BOECKH (University Regensburg, Germany); for doing the work that resulted in beautiful photographs of teeth: A. KUHN (University Regensburg, Germany). For use of museum facilities and technical assistance: F. KRUPP and H. ZETZSCHE (SMF). For use of computer services and other administrative facilities: M. THOMPSON (Hohenfels American Middle/High School, Hohenfels, Germany).

3. Key to *Sicydium* from the Dominican Republic

1 Upper jaw teeth in a single row **2**
– Upper jaw teeth in two rows ..... ***Sicydium plumieri***
2 Upper jaw teeth tricuspid **3**
– Upper jaw teeth unicuspid, somewhat spatulate, worn teeth may appear bicuspid ..... ***Sycidium buscki***
3 Anterior aspect of all upper jaw teeth face forward, teeth laterally and posteriorly overlapping, outer cusps of each tooth rounded; belly usually naked in adults, scales in zigzag series usually 12–13 (range 11–15), scales in lateral series usually 52–55 (range 47–62) ..... ***Sicydium punctatum***

Table 1. Number of upper jaw teeth in species of *Sicydium* known from the Dominican Republic.

	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
S. buscki	1	-	-	2	7	9	9	18	14	33	24	17	28	19	10	10	8	3	4	2
S. gilberti											1	-	-	1	1	1	2	2	3	3
S. plumieri	1	1	-	3	1	3	6	5	5	1	5	8	7	6	10	8	6	9	8	9
S. punctatum							3	2	5	6	12	5	17	15	7	-	2	3	2	4

Table 1 (continued)

	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
S. buscki	-	1	-	1	-	1														
S. gilberti	-	4	3	2	-	2	-	2	2	1	1	2	-	1	-	-	-	1	1	1
S. plumieri	3	11	6	11	11	8	8	9	7	5	2	3	-	1	3	-	-	-	-	2
S. punctatum	-	2	-	-	-	-	-	-	1	2	1	-	-	-	-	1				

Table 1 (continued)

	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83
S. gilberti	2	-	5	1	-	1	2	-	2	-	2	1	-	2	1	-	-	-	1
S. plumieri	1	-	-	-	-	-	-	-	1	-	1								

Table 2. Number of pectoral rays in species of *Sicydium* known from the Dominican Republic.

	17	18	19	20	21	22
S. buscki			5	69	123	17
S. gilberti			2	25	29	1
S. plumieri	1	5	51	107	31	1
S. punctatum	1	32	27	7	20	1

– Anterior aspect of all upper jaw teeth face outward having a side by side orientation, outer cusps of each tooth pointed; belly usually scaled in adults, scales in zigzag series usually 18–20 (range 14–22), scales in lateral series usually 60–65 range 56–72 ..... ***Sicydium gilberti* n.sp.**

4. Species accounts

4.1. *Sicydium buscki* Evermann & Clark, 1906

Busck's stone biting goby (Figs. 2–5)

Sicydium buscki Evermann & Clark, 1906: 854 (type locality: San Francisco Mountains, Dominican Republic; holotype USNM 53276)

Material

229 specimens from the Dominican Republic, Cuba and Puerto Rico, totalling 97 males, 127 females, 5 juveniles, size range 21.2–77.5 mm SL, largest male 70.8, largest female 77.5, smallest gravid female 36.8.

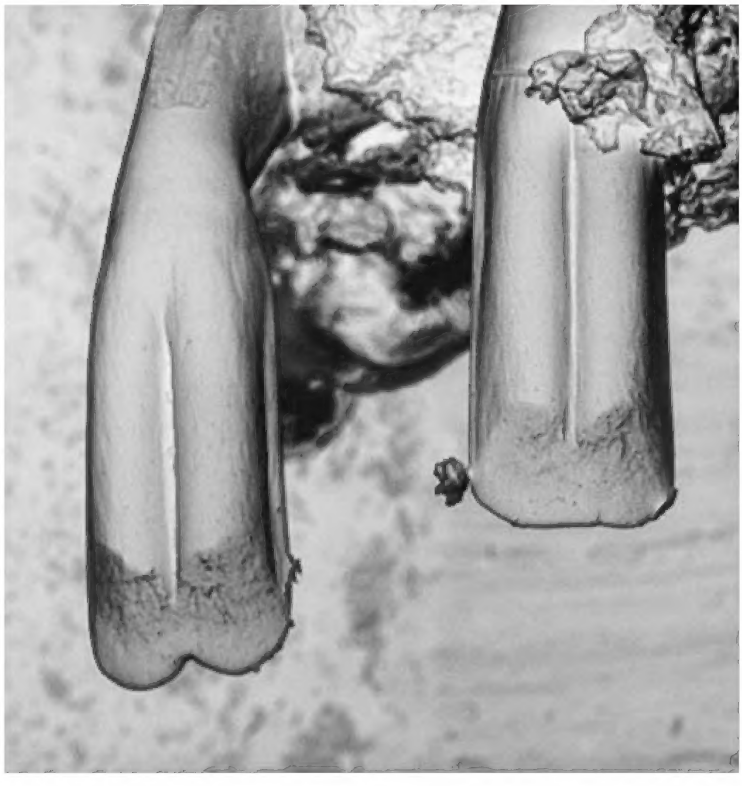


Fig. 2. Upper jaw teeth of *Sicydium buscki,* SMNS 17308, female (53.2 mm SL); crown size of left tooth 89.3 µm X 259.8 µm; distal margin showing wear from grazing rock surfaces.

Cuba. UF 10372, female (46.0); Distrito Oriente; 16 Sep. 1952, W. M. McLane et alii.
Dominican Republic. MHNG 2572.70, female (52.3); Rio Baoruco, road towards Padernales; 30 July 1994, P. de Rham et alii. – MHNG 2572.71, 1 male, 6 females (27.9–43.9); Río Nizao; 29 July 1994, P. de Rham et alii. – NTM S.13084–002, 2 males, 1 female (28.1–33.0); Río Banilejo; 17 Mar. 1990, U. Schulz & H.-J. Troschel. – NTM S. 13085–002, 2 males, 3 females (41.1–49.6); Río Nizao; 18 Mar. 1990, U. Schulz & H.-J. Troschel. – SMNS 11304, 13 males, 13 females, 3 juveniles (21.2–56.1); Río Bajabonico at Imbert, 35 km NW Santiago; 1 Mar. 1990, U. Schulz & H.-J. Troschel. – SMNS 11406, 7 males, 17 females (25.4–70.8); Río Nazaito, 300 m from mouth entering ocean, 100 m N Paraiso, 25 km SSW Barahona; 13 Mar. 1990, U. Schulz & H.-J. Troschel. – SMNS 11429, 9 males, 10 females (24.4–39.3); small brook entering Monte Río near mouth into ocean, 5 km SSW Azua, 80 km W Santo Domingo; 16 Mar. 1990, U. Schulz & H.-J. Troschel. – SMNS 11439, 11 males, 7 females (44.8–67.2); Río Banilejo into Río Ocoa, WNW San José de Ocoa, 55 km W Santo Domingo; 17 Mar. 1990, U. Schulz & H.-J. Troschel. – SMNS 11449, 1 male, 2 females (69.4–77.5); Río Nagua, 9 km ENE San Francisco Macoris; 23 Feb. 1990, U. Schulz & H.-J. Troschel. – SMNS 17307, 34 males, 46 females, 1 juvenile (22.9–73.8); Río Baonico, 20 m from mouth, 1.5 km NE La Cienaga, 15 km S Barahona; 13 Mar. 1990, U. Schulz & H.-J. Troschel. – SMNS 17308, 6 males, 7 females (43.2–60.0); Río Nizao, 32 km WSW Santo Domingo; 18 Mar. 1990, U. Schulz & H.-J. Troschel. – UF 90936, 1 male, 4 females, 1 juvenile (25.4–43.4), UF 101794, 4 males, 6 females (31.9–54.0); Provincia Barahona; 13 Mar. 1990, U. Schulz & H.-J. Troschel. – UF 101795, 1 male, 1 female (27.2–29.8); Provincia Azue; 16 Mar. 1990, U. Schulz & H.-J. Troschel. – UF 101796, 3 males, 1 female (45.0–58.9); Provincia Peravia; 17 Mar. 1990, U. Schulz & H.-J. Troschel.
Puerto Rico. UF 101791, male (40.1); Maricaco; July 1954, D. S. Erdman et alii. – UF 101792, male (70.2); Arecibo; 5 Jun. 1954, D. S. Erdman et alii. – UF 101793, female (56.4); Aquadilla; 5 Jun. 1954, D. S. Erdman et alii.

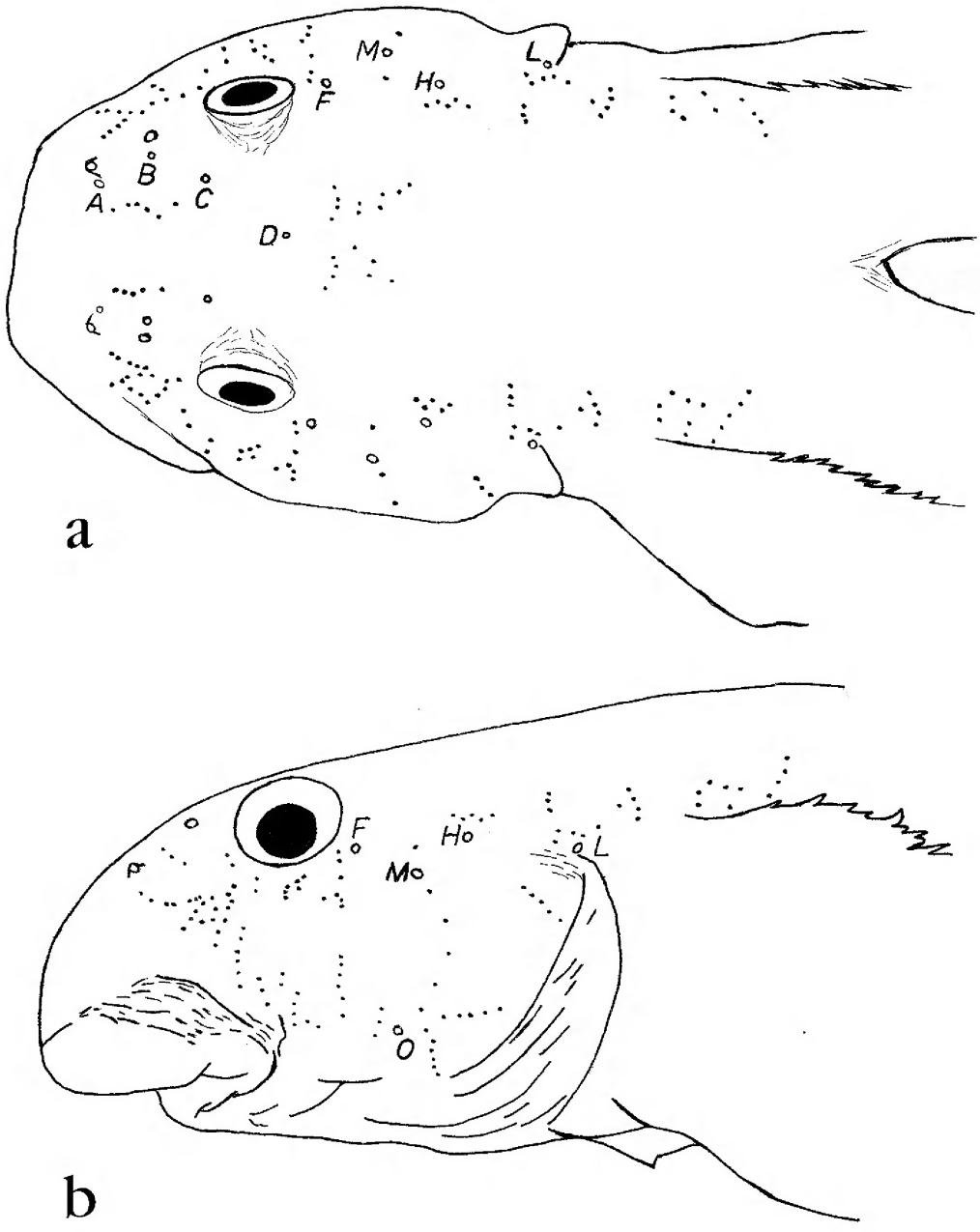


Fig. 3a–c. Head of *Sicydium buscki* showing cephalic sensory pore system and cutaneous sensory papillae. – a. Dorsal view; b. lateral view; c. ventral view (opposite).

Diagnosis

Upper jaw teeth roughly unicuspid in a single row with anterior aspect of all teeth facing forward. Preopercular pores M and O. Predorsal midline anteriorly and belly anteriorly naked. Scales in zigzag series usually 14–15 (range 12–18).

Redescription

D VI–I,9 (3), VI–I,10 (214), D1 higher than D2 in adults, spines 3 and 4 filamentous in males, spines usually not filamentous in females. A I,9 (5), I,10 (211), I,11 (1), directly opposite to D2. P usually 21 (range 19–22), usually ventralmost 2 rays simple (range 1–3), posterior margin rounded. C 13–14 (range 11–16), posterior margin rounded. LS usually 55–60 (range 49–71), ctenoid scales laterally, dorsally and ventrally mostly cycloid, scales posterior to hypural base cycloid. TRB usually 19–21 (range 16–26). TRF variable corresponding to size of specimen (range 16–36), adults usually with more scales. PD variable (range 0–19), usually naked anteriorly, cycloid scales usually present anterior to D1 origin. Belly in adults usually with cycloid scales close to anus, anteriorly naked, naked in immature specimens. ZZ usually 14–15 (range 12–18). Head, breast and pectoral base naked. Upper jaw teeth in a single row and widely spaced numbering 25–50, all teeth face forward in adults, not obvious in small specimens, teeth anteriorly with a side by side orientation, laterally and posteriorly with anterior aspect of each tooth facing forward causing each tooth to overlap tooth posterior to it, each upper jaw tooth broadly reinforced anteriorly with a prominent groove medially. Gum appears as finger-like projections between upper jaw teeth to about half length of crown. Lower jaw teeth canine in males, usually 3–4 (range 1–8), and conical in females, usually 2–4 (range 1–6), anterior and posterior teeth largest, teeth larger in males than females. Inside of upper lip with a slightly papillous medial ridge. Cephalic sensory pore system A, B, C, D, F, H, L, M and O, pore D singular, all others paired. Cutaneous sensory papillae well developed on head.

Sexual dimorphism well developed. Unpaired fins longer in males. Urogenital papilla, males somewhat triangular, bilobed distally with a narrow slit between lobes, females rounded distally with a fimbriate opening.

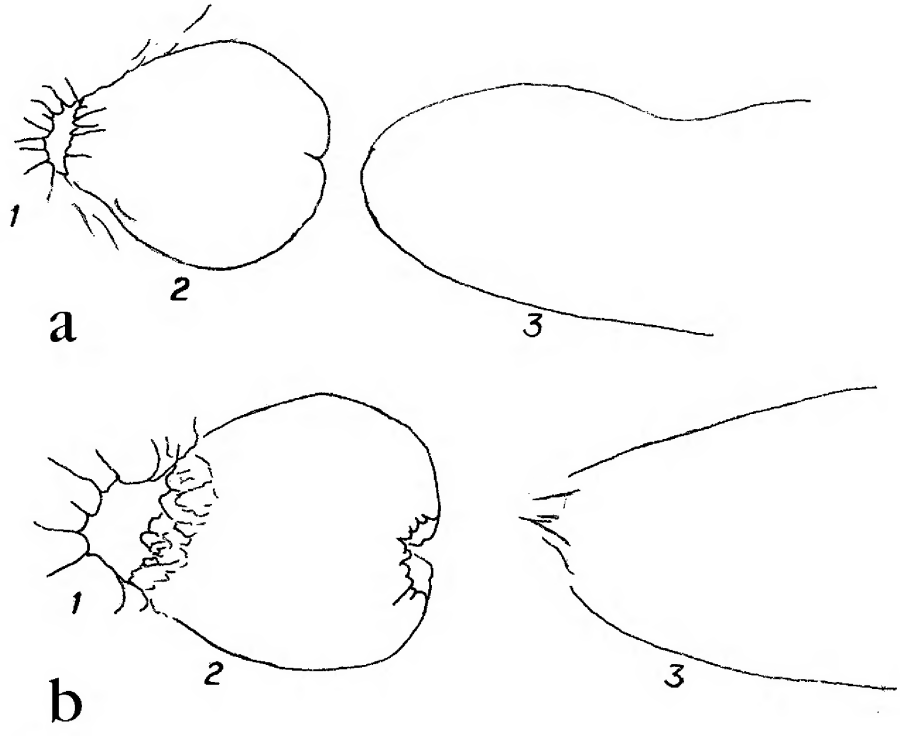


Fig. 4a–b. Urogenital papilla of *Sicydium buscki.* – a. Male; b. female; *1.* anus; *2.* urogenital papilla; *3.* anal fin.

Color in alcohol: Background of body cream to tannish gray. Usually 6 fairly broad oblique brownish to dusky blackish bars laterally, intensity of bars vary with immature material tending to be more prominent, bars darkest dorsal to midline, bars may be reduced and prominent along midline, or with markings close to dorsum appearing as dusky scribbles. Caudal fin base usually with a dusky bar, may be absent or appear as a circular spot, not usually obvious in males. Body ventrally with or without pigment. Background of head cream to tannish gray. Dusky bar extending from orbit ventrally to posterior region of upper lip, may not be apparent in juveniles. Nape dusky in juveniles and with 3 or 4 bars in mature specimens. Cheek usually slightly dusky, remainder of head with scattered pigment, including nape and upper lip. Head ventrally mostly without pigment, juveniles without, females with little, and males with scattered pigment. First dorsal spines gray, membrane dusky in males, slightly dusky in females, and clear in juveniles. Second dorsal fin mostly dusky with a blackish distal margin. Caudal fin slightly dusky with a clear distal margin. Anal fin, basal half with little or no pigment, distal half slightly dusky, distal margin black in males, clear in females and juveniles. Pelvic disk without pigment. Pectoral fin slightly dusky, prominent basally on rays, pectoral base dusky.

Sexual dichromatism evident with markings more obscure and dusky in males.

Juveniles almost always with markings bolder than adults.

Distribution

Known from Cuba, Dominican Republic and Puerto Rico.

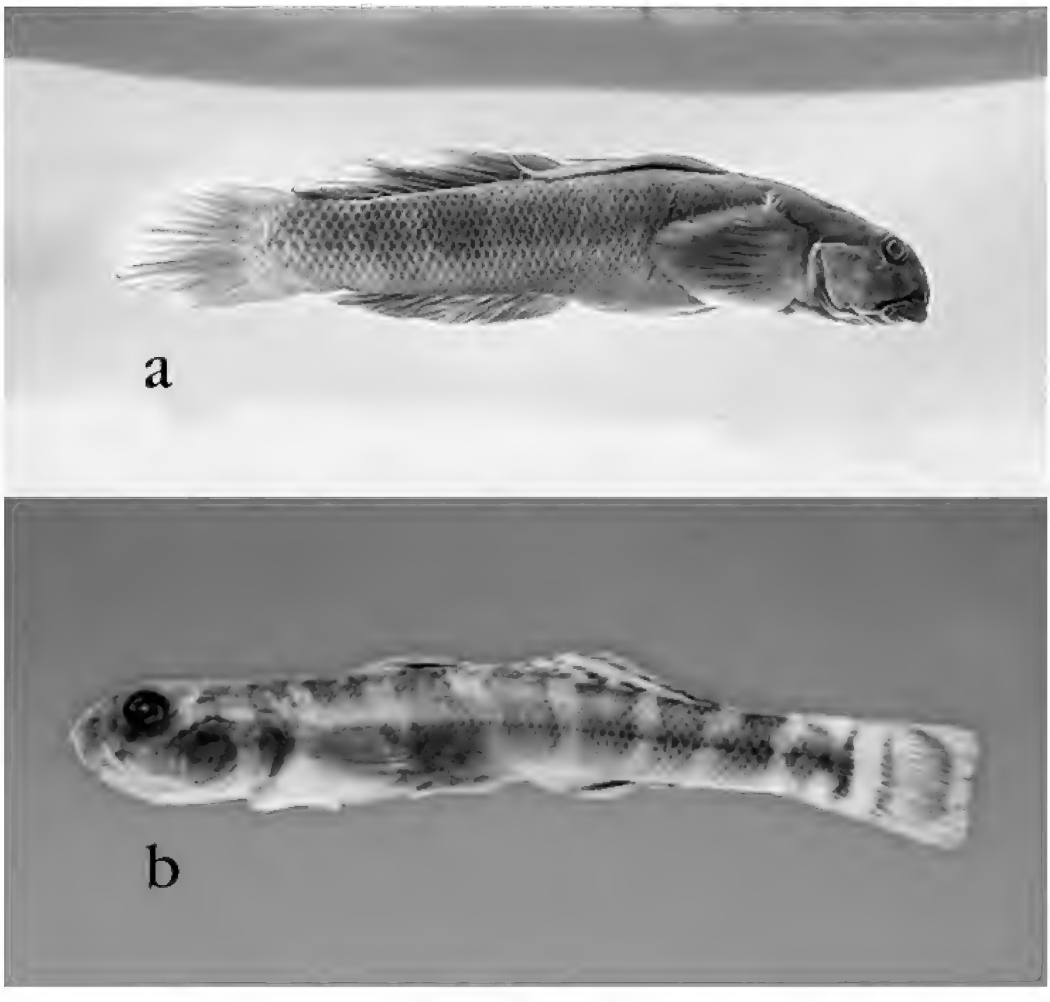


Fig. 5a–b. *Sycidum buscki.* – a. SMNS 11406, male (70.8 mm SL); b. SMNS 11304, juvenile (22.4 mm SL).

Relationships

EVERMANN & CLARK (1906) considered *S. buscki* and *S. punctatum* to be closely related. The two differ in morphology of upper jaw teeth and intensity of coloration.

4.2. *Sicydium gilberti* **n.sp.**

Gilbert's algae eating goby (Figs. 6–9)

Material

60 specimens from the Dominican Republic and Puerto Rico totalling 5 males, 33 females and 22 juveniles, size range 24.0–71.4 mm SL, largest male 67.9, largest female 71.4, smallest gravid female 47.4.

Holotype: SMNS 17309, male (67.9); Dominican Republic: Río Baonico, 20 m from mouth, 1.5 km NE La Cienaga, 15 km S Barahona; 13 Mar. 1990, U. SCHULZ & H.-J. TROSCHEL.

Paratypes: **Dominican Republic.** MHNG uncat., female (31.9); Río Niazo; 29 July 1994,

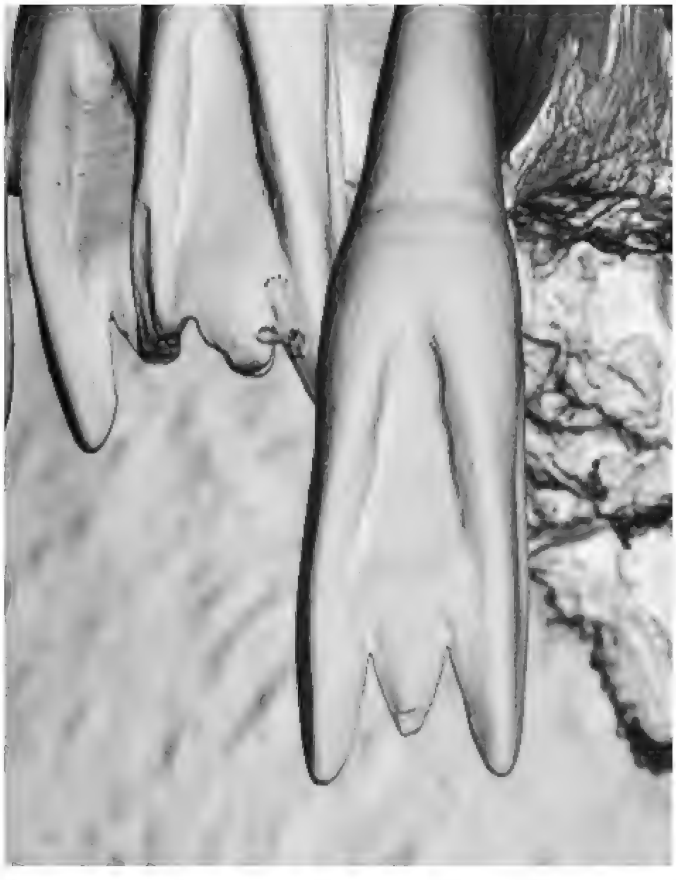


Fig. 6. Upper jaw teeth of *Sicdium gilberti* n.sp., SMNS 17310, paratype, female (58.8 mm SL); crown size of right tooth 77.2 µm X 190.7 µm.

P. de Rham. – NTM S.13085-003, 1 male, 1 female (32.4–40.6); Río Nizao; 18 Mar. 1980, U. Schulz & H.-J. Troschel. – SMNS 17310, 2 males, 25 females, 17 juveniles (24.7–60.5), same collection data as holotype. – SMNS 17311, 2 juveniles (29.9–31.1); Río Nazaito, 300 m from mouth entering ocean, 100 m N Paraiso, 25 km SSW Barahona; 13 Mar. 1990, U. Schulz & H.-J. Troschel. – SMNS 17312, 1 male, 2 females (36.2–47.4); Río Nizao, 32 km WSW Santo Domingo; 18 Mar. 1990, U. Schulz & H.-J. Troschel. – UF 101798, 3 females, 2 juveniles (31.9–56.9), 3 females, 2 juveniles; Provincia Barahona; 13 Mar. 1990, U. Schulz & H.-J. Troschel. – UF 101799, juvenile (35.4); Provincia Barahona; 13 Mar. 1990, U. Schulz & H.-J. Troschel.
Puerto Rico. UF 101797, female (71.4); Aquadilla; 5 June 1954, D. S. Erdman et alii.

Etymology

The new species is named in honor of Carter Gilbert (UF), who for more than three decades has contributed much to our knowledge of fishes in the northwestern hemisphere, and assisted many like myself.

Diagnosis

Upper jaw teeth distinctively trident-like in a single row with anterior aspect of each tooth facing outwards, having a side by side appearance. Preopercular pores almost always M, N and O. Predorsal midline variable ranging from naked anteriorly

to fully scaled. Belly fully scaled in adults. Scales in zigzag series usually 18–20 (range 14–22).

Description

D VI–I,9 (2), VI–I,10 (56), D1 usually higher than D2, spines usually long and filamentous in both sexes, longer in males. A I,9 (2), I,10 (56), directly opposite to D2. P usually 20–21 (range 19–22), ventralmost 2–3 rays simple (range 1–4), posterior margin rounded. C 12 (3), 13 (40), 14 (13), 15 (2), posterior margin rounded. LS 60–65 (range 56–72), laterally most scales ctenoid, posterior to hypural base mostly cycloid with few ctenoid. TRB 21–26 (range 19–29). TRF variable 19–41, scales small, number increases with size of individual. PD variable 14–25, with cycloid scales, may be naked anteriorly. ZZ usually 18–20 (range 14–22). Belly in adults with small cycloid scales, immature specimens usually naked anteriorly. Head, breast and pectoral base naked. Upper jaw teeth trident-like with three sharp cusps, central cusp slightly shorter than those laterally (range 35–83), number tends to increase with size of specimen, teeth with a side by side orientation, anterior aspect of all teeth facing outward. Lower jaw teeth canine-like, present in all individuals, males 3–5, females usually 2–3 (range 1–6), males with larger teeth. Gum restricted to base of crown in upper jaw teeth, without finger-like projections. Papillous ridge present medially on inside of upper lip. Cephalic sensory pore system usually A, B, C, D, F, H, L, M, N and O, pore D singular, all others paired, 4 specimens without pore N. Cutaneous sensory papillae well developed on head.

Sexual dimorphism well developed. Including characteristics mentioned above, males with much longer unpaired fins. Urogenital papilla bilobed, males with a narrow slit distally between lobes, females larger with a fimbriate opening.

Color in alcohol: Juveniles (<30 mm SL) tan to light brown with blackish barring. Caudal fin with 3 or 4 bars. First dorsal fin with broad black band. Specimens >30 mm SL with 'V' shaped bars laterally, prominent above midline. Caudal fin with irregular barring and blotches. First dorsal fin without black band. Greater than 50 mm SL bars become faint with both sexes appearing grayish. Males with dusky bars along dorsum, most prominent ventral to second dorsal fin and on caudal peduncle. Markings in females variable, may be with dusky bars, blotchy, a distinct or indistinct midlateral band. Black 'V' shaped bar always present ventral to eye.

Distribution

Known from the Dominican Republic and Puerto Rico.

Relationships

At present it appears most closely related to *S. salvini* Ogilvie-Grant, 1884 from Pacific slope streams of Central America and Colombia, but differs in having scales over the entire belly, and more lateral and predorsal scales. Upper jaw teeth similar to *S. crenilabrum* Harrison, 1993 from West Africa, but differs in coloration, squamation and number of teeth. Though *S. gilberti* appears identical to *S. plumieri,* it differs in upper jaw dentition, lower lip does not obscure posterior teeth when viewed laterally, and does not have finger-like projections of gum between upper jaw teeth.

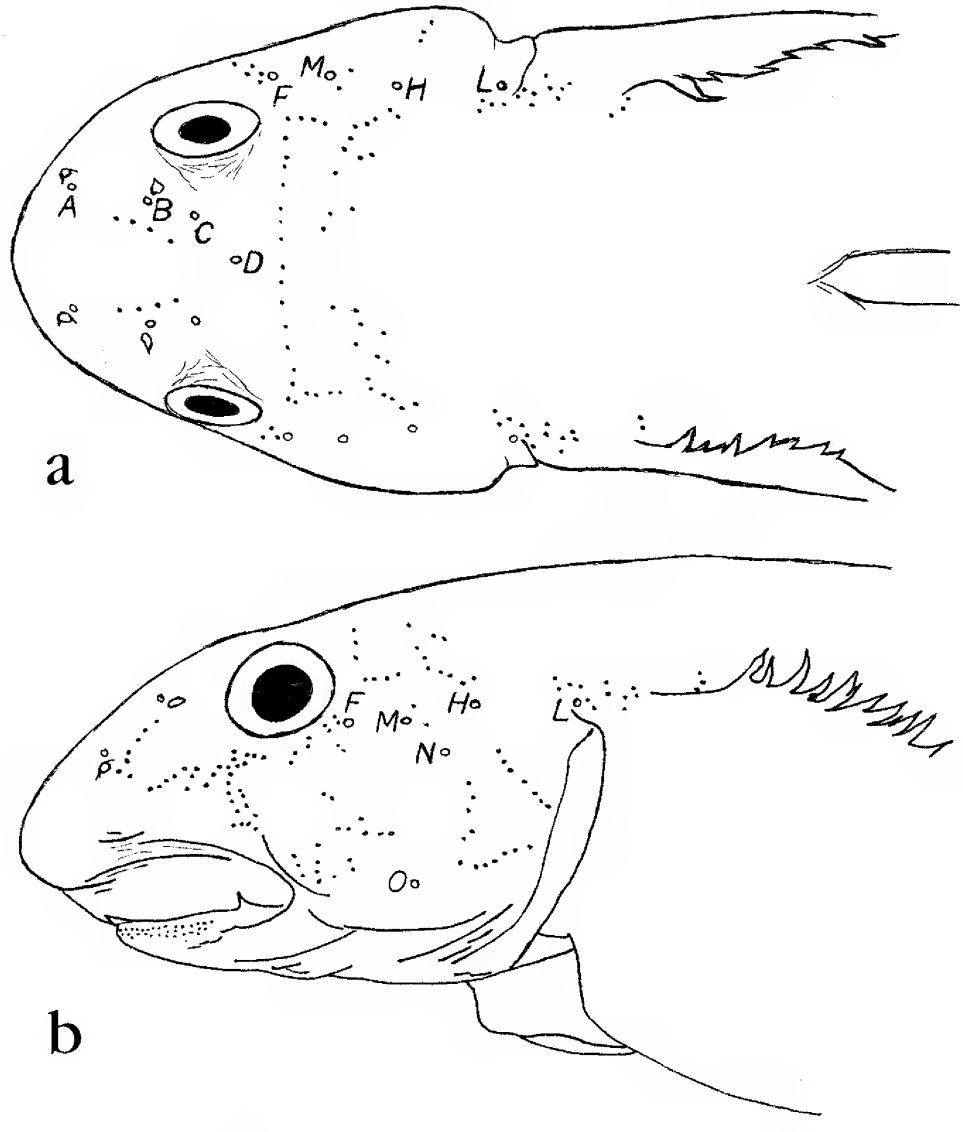


Fig. 7a–c. Head of *Sicydium gilberti* n.sp. showing cephalic sensory pore system and cutaneous sensory papillae. – a. Dorsal view; b. lateral view; c. ventral view (opposite).

4.3. *Sicydium plumieri* (Bloch, 1786)

Plumier's stone biting goby (Figs. 10–13)

Gobis Plumieri Bloch, 1786: 125 (type locality: Martinique; no type, species based on a painting; **neotype** SMNS 11331 as designated below).
Sicydium siragus Poey, 1860: 278 (type locality: Cuba; status of type or types unknown) (Poey, 1860).
Sicydium antillarum Ogilvie-Grant, 1884: 157 (type locality: Barbadoes; holotype BMNH).
Sicydium vincente Jordan & Evermann, 1898: 2207 (type locality: St. Vincent; status of type unknown).
Sicydium caguitae Evermann & Marsh, 1902: 291 (type locality: Río Caguita, Puerto Rico; holotype USNM).

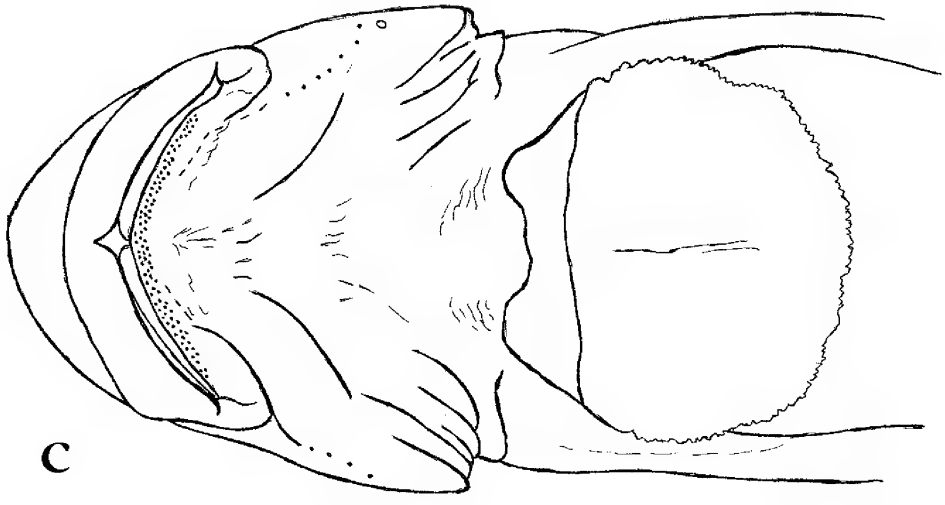


Fig. 7c.

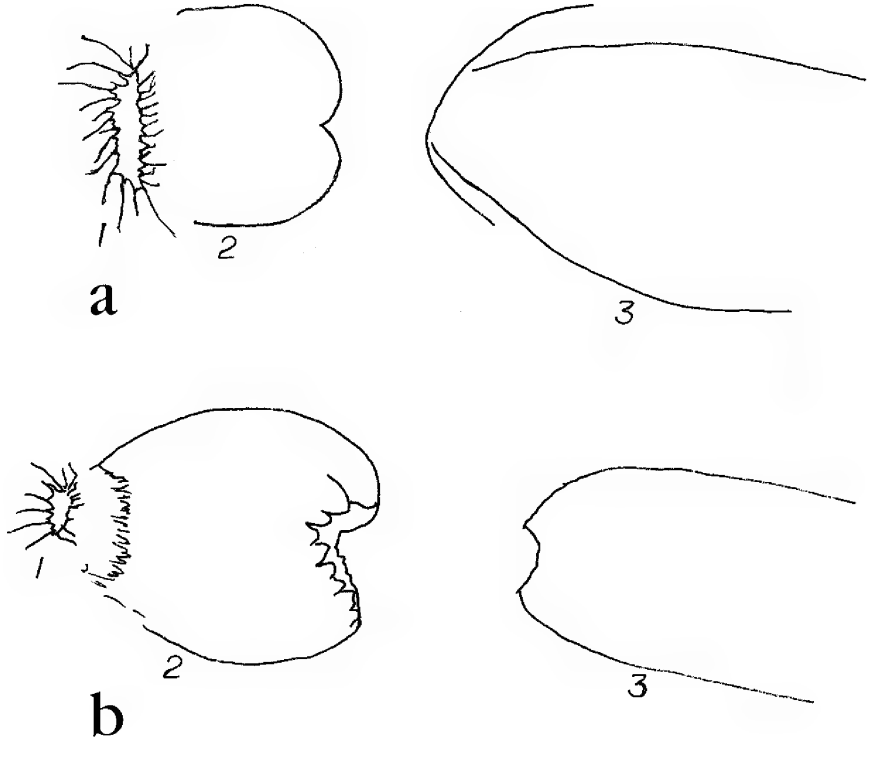


Fig. 8a–b. Urogenital papilla of *Sicydium gilberti* n.sp. – a. Male; b. female; *1.* anus; *2.* urogenital papilla; *3.* anal fin.

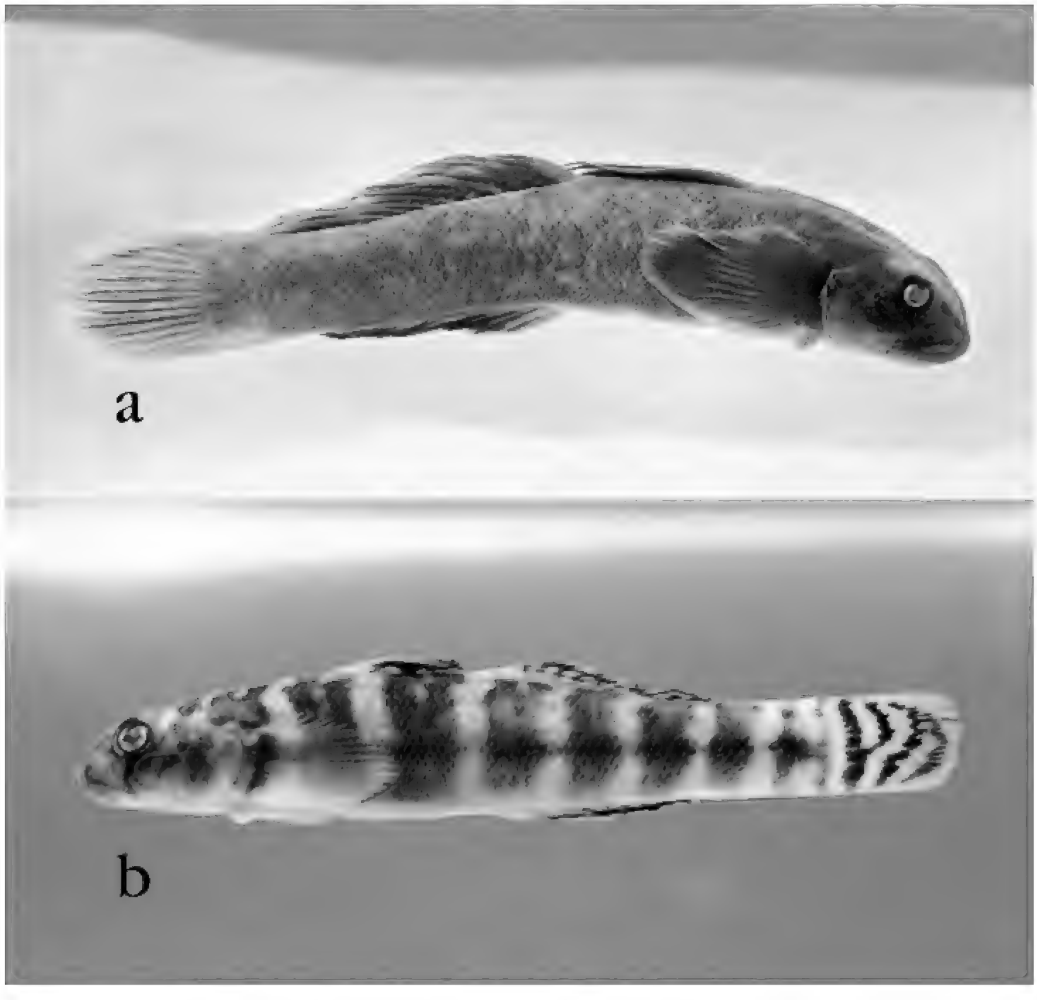


Fig. 9a–b. *Sicydium gilberti* n.sp. – a. SMNS 17309, holotype, male (67.9 mm SL); b. SMNS 17310, paratype, juvenile (31.2 mm SL).

Material

139 specimens from the Dominican Republic, Puerto Rico, Martinique and Panama, totalling 64 males, 68 females and 7 juveniles, size range 27.6–133.4 mm SL, largest male 108.9, largest female 133.4, smallest gravid female 56.9.

Neotype: SMNS 11331, female (133.4); Dominican Republic: Río Seibo, 15 km NW El Seibo, 50 km NE San Pedro de Macoris; 6 Mar. 1990, U. Schulz & H.-J. Troschel.

Dominican Republic. MHNG 2572.68, 2 males (98.4–100.9); near Bemarahona, SW Santo Domingo; July/Aug. 1994, P. de Rham et al. – MHNG uncat., male (49.5); Río Niazo; 29 July 1994, P. de Rham et al. – NTM S. 13084-001, juvenile (32.3); Río Banilejo into Río Ocoa, 55 km W Santo Domingo; 17 Mar. 1990, U. Schulz & H.-J. Troschel. – NTM S. 13085-001, female (46.9); Río Nizao, 32 km WSW Santo Domingo; 18 Mar. 1990, U. Schulz & H.-J. Troschel. – SMNS 11285, female (100.9); Río Maguar, 500 m above mouth into ocean, 7 km E Sánchez; 25 Feb. 1990, U. Schulz & H.-J. Troschel. – SMNS 11325, 5 males, 4 females (47.8–87.5); Río Azui, 3 km NW Batey Consuelito, 20 km NNW San Pedro de Macoris; 5 Mar. 1990, U. Schulz & H.-J. Troschel. – SMNS 11399, 44 males, 40 females, 4 juveniles (30.8–108.9); Río Baonico, 20 m from mouth into ocean, 1.5 km NE La Cienaga, 15 km S Barahona; 13 Mar. 1990, U. Schulz & H.-J. Troschel. – SMNS 11442, 9 males, 9 females (36.6–59.2); same data as NTM S. 13085-001. – SMNS 17303, 4 females (84.2–124.9); same da-

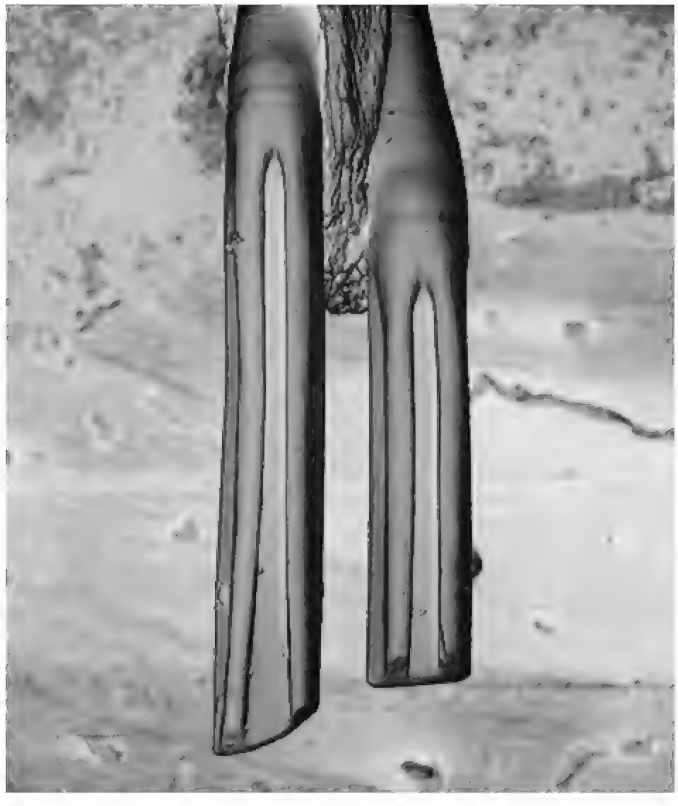


Fig. 10. Upper jaw teeth of *Sicydium plumieri*, SMNS 17303, female (124.9 mm SL); crown size of left tooth 92.6 µm X 570 µm; distal margin showing wear from grazing rock surfaces.

ta as neotype. – SMNS 17304, 1 male, 2 females (55.8–70.7); Río Bajabonico at Imbert, 35 km NW Santiago; 1 Mar. 1990, U. Schulz & H.-J. Troschel. – SMNS 17305, 3 females (30.1–39.8); small beach brook entering Monte Río near mouth into ocean, 5 km south SE Azua, 80 km W Santo Domingo; 16 Mar. 1990, U. Schulz & H.-J. Troschel. – SMNS 17306, 3 females, 2 juveniles (29.1–82.1); same data as NTM S. 13084-001. – UF 90934, 2 males, 2 females (56.4–90.2); Provincia Barahona; 13 Mar. 1990, U. Schulz & H.-J. Troschel. – UF 90945, female (53.6); Provincia Azue; 16 Mar. 1990, U. Schulz & H.-J. Troschel. – UF 90952, male (85.4); Provincia Peravia; 17 Mar. 1990, U. Schulz & H.-J. Troschel.
Martinique. INP.ENSAT uncat., 6 males, 6 females, 1 juvenile (27.6–85.8); rivière Capot at Vive; Oct. 1996, INP.ENSAT.
Panama. UF 19703, male (45.4); San Blas; 13 Mar. 1965, F. W. Brockmann et alii. – UF 19748, 4 males, 1 female, 1 juvenile (26.2–61.3); Bocas del Toro; 20 Apr. 1965, F. W. Brockmann. – UF 64782, 4 males, 4 females (31.8–48.2); San Blas; 3 May 1965, F. W. Brockmann.
Puerto Rico. UF 7294, 2 males, 3 females (33.8–38.8); Maricaco; July 1952, D. S. Erdman. – UF 64785, 3 males, 3 females (52.4–66.9); Arecibo; 5 Jun. 1954, D. S. Erdman et alii. – UF 76880, 9 males, 8 females (67.1–116.0); Aquadilla: Río Guaba, road bridge near Maricao; 5 Jun. 1954, D. S. Erdman et alii.

Diagnosis

Upper jaw teeth slender, appearing unicuspid in 2 rows, anterior aspect of teeth almost always facing forward, may vary. Preopercular pores almost always M, N and O. Predorsal midline and belly fully scaled in adults. Scales in zigzag series usually 19–21 (range 16–24).

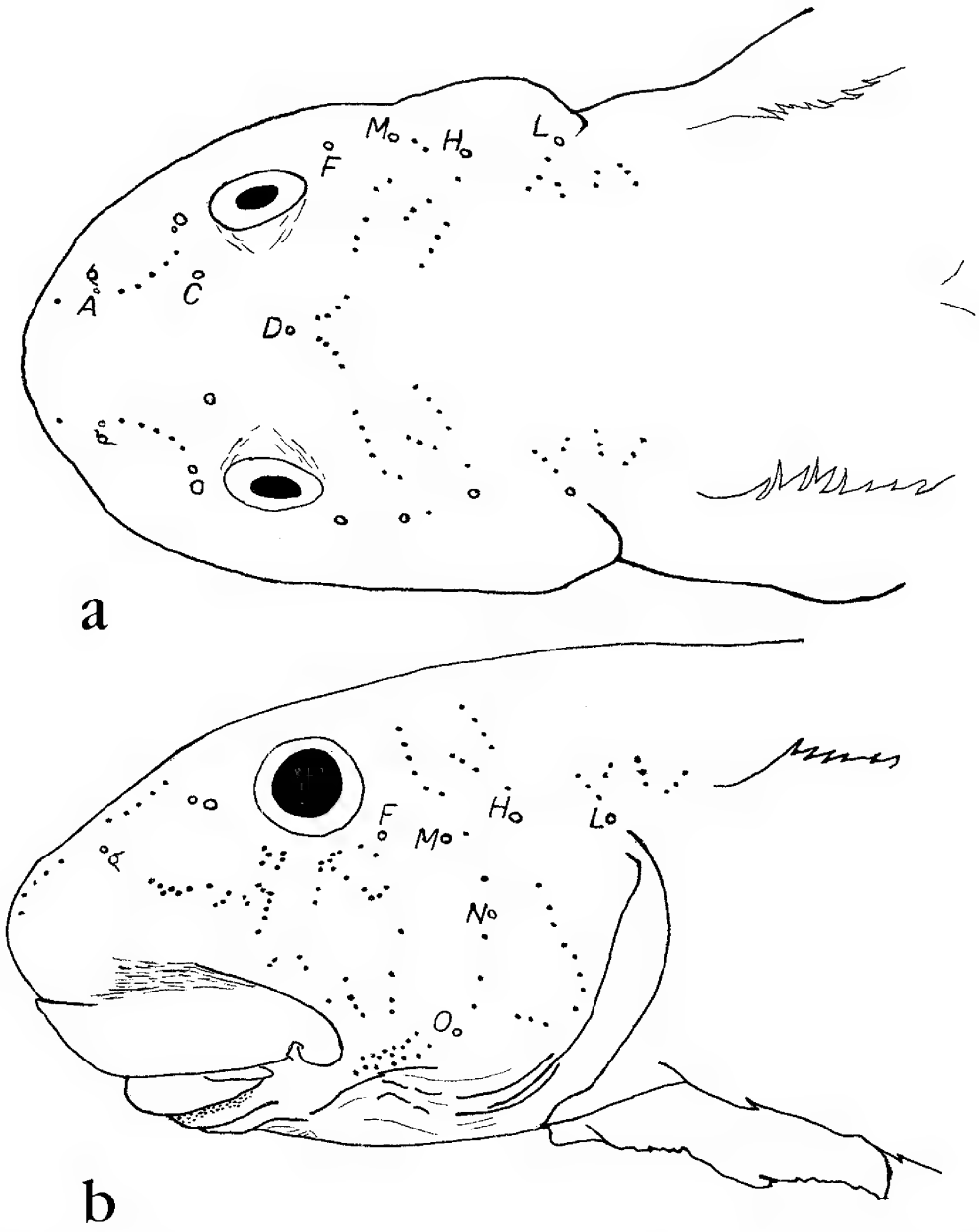


Fig. 11a–c. Head of *Sicydium plumieri* showing cephalic sensory pore system and cutaneous sensory papillae. – a. Dorsal view; b. lateral view; c. ventral view (opposite).

Redescription

D VI–I,10 (90), VI–I,11 (1), D1 usually higher than D2, basally D1 membrane joins D2 in males and usually not in females, spines filamentous in both sexes, spines 3 or 4 may extend posteriorly beyond posteriormost D2 ray in males. A I,9 (2), I,10 (88), I,11 (1), directly opposite to D2. P usually 20 (range 17–21), usually ventralmost 2 rays simple (range 1–4), posterior margin rounded. C usually 13 (range 12–15), posterior margin rounded. LS usually 62–67 (range 58–74), scales laterally ctenoid, dorsally and ventrally cycloid, scales posterior to hypural base cycloid.

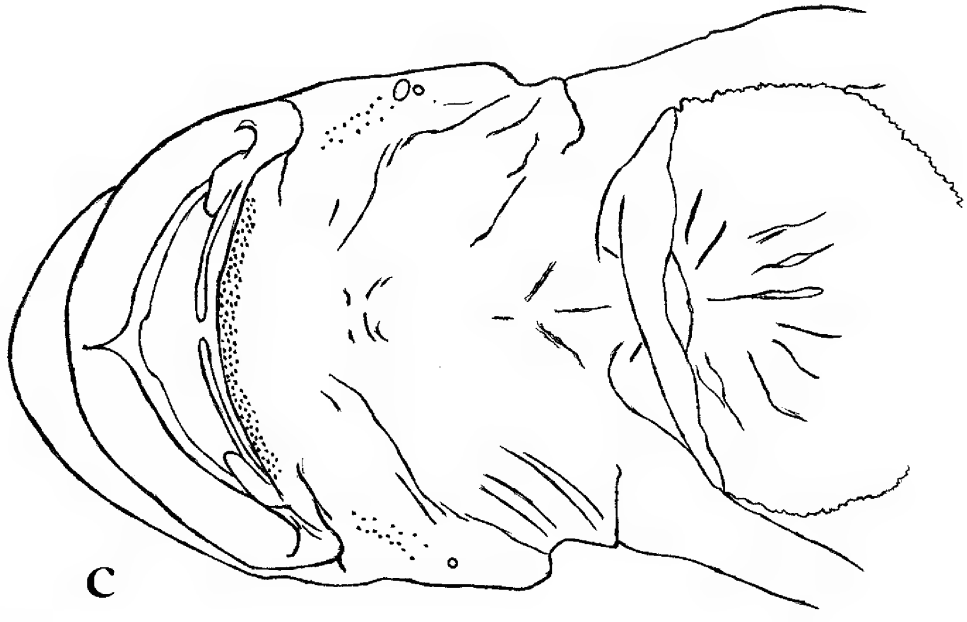


Fig. 11c

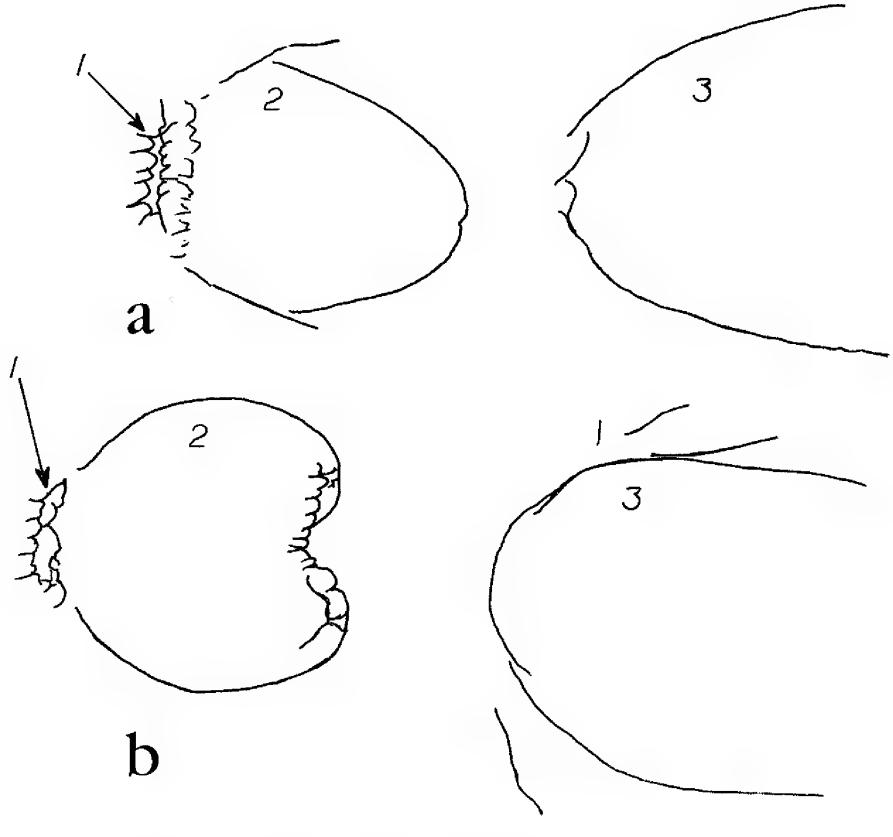


Fig. 12a–b. Urogenital papilla of *Sicydium plumieri.* – a. Male; b. female; *1.* anus; *2.* urogenital papilla; *3.* anal fin.

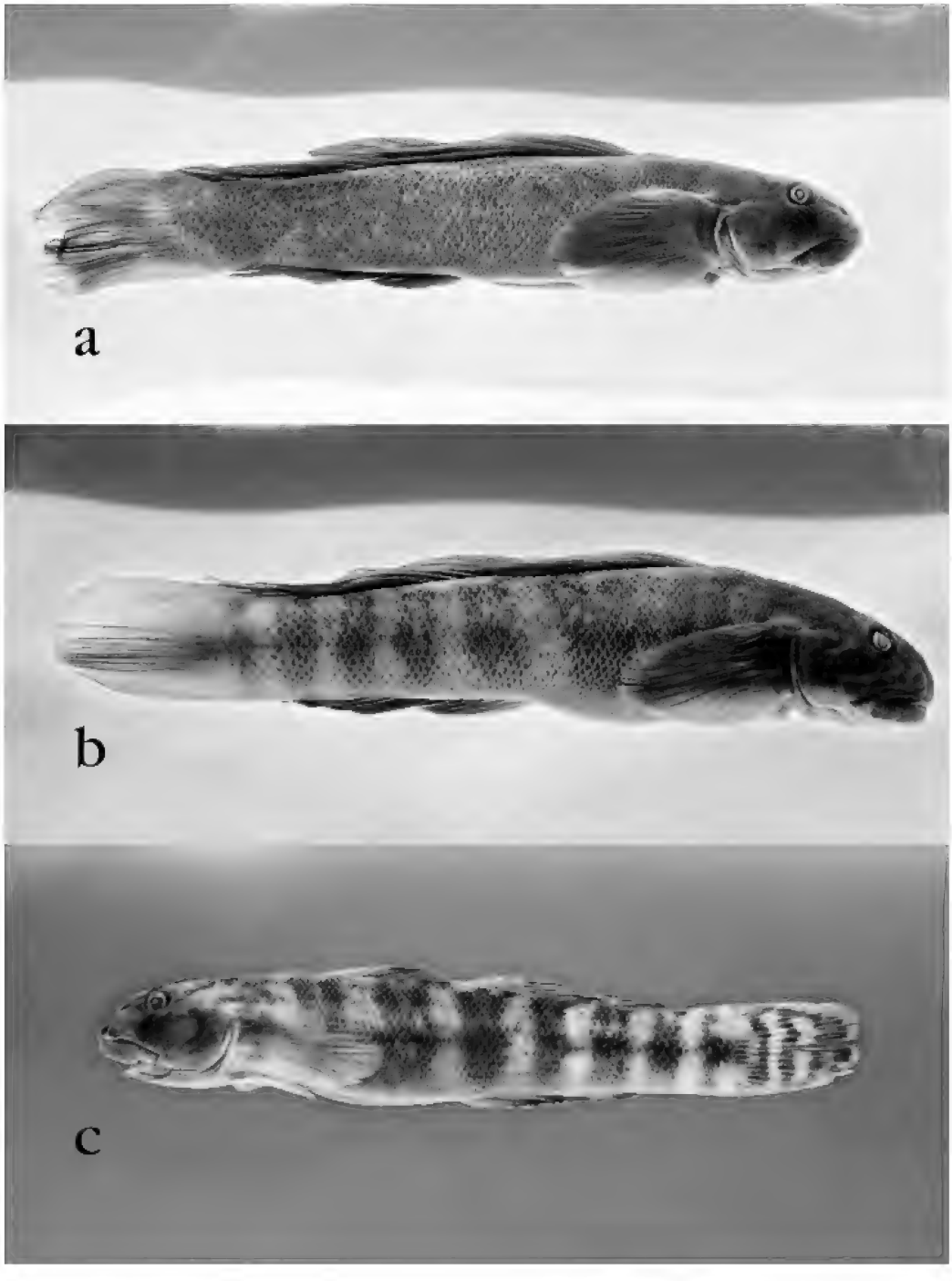


Fig. 13a–c. *Sicydium plumieri.* – SMNS 11399, male (102.6 mm SL); b. SMNS 11399, male (84.3 mm SL); c. SMNS 11399, male (40.2 mm SL).

TRB usually 23–26 (range 20–31). TRF variable, large individuals with more scales (range 22–47). PD cycloid, usually 21–25 (range 10–31), adults fully scaled. Belly covered with small cycloid scales in adults, immature individuals usually with scales restricted to posterior half. ZZ usually 19–21 (range 16–24). Head, breast and pec-

toral base naked. Upper jaw teeth in 2 rows, number of teeth in outer row variable with larger specimens having more teeth than smaller individuals (range 25–75), new upper jaw teeth finely tricuspid, tiny cusps on each tooth quickly wear away giving a unicuspid appearance, each tooth with two reinforced ridges, anteriorly and 1 laterally, 1 is entirely rounded and straight, the other curving inwards slightly with another less obvious ridge at a right angle to it. Lower jaw teeth canine-like, both sexes usually 3–5 (range 1–7), males with larger teeth than females. Gum in upper jaw extends around teeth to about two thirds length of crown appearing as finger-like projections. Cephalic sensory pore system almost always A, B, C, D, F, H, L, M, N and O, pore D singular, all others paired, pore N sometimes absent. Cutaneous sensory papillae well developed on head.

Color in alcohol: Markings identical to *S. gilberti.*

Color in life (after Erdman, 1986): Markings similar to that in preservation with body and head being slightly greenish, belly silvery. Caudal fin reddish brown dorsally and ventrally with upper margin mostly whitish. Anal fin greenish basally with a black distal margin. Pectoral fin with upper margin whitish, distal margin slightly bluish.

Distribution

Widely distributed throughout the Greater and Lesser Antilles, and Panama.

Relationships

Sicydium plumieri is most closely related to *S. cocoense* based on the dentition in the upper jaw, but can be separated in having more teeth in the upper jaw, in almost always having pore N present, and in having ctenoid scales laterally. The few specimens of *S. cocoense* examined were without pore N and with only cycloid scales.

Remarks

Past accounts of *S. plumieri* have been confusing. Valenciennes in Cuvier & Valenciennes (1837) stated examining *S. plumieri* from Puerto Rico. Günther (1861) stated examining a single specimen of *S. plumieri* from Barbados and other specimens from the West Indies. Jordan & Eigenmann (1887) and Jordan & Evermann (1898) considered *S. plumieri* and *S. antillarum* to probably be the same, further stating having not seen any specimens of *S. antillarum.* Only Ogilvie-Grant (1884) states having examined seven specimens of *S. plumieri* with the largest being seven inches and his account of *S. antillarum* was based on a single specimen, the holotype, stated to be four and $^3/_4$ inches long.

The identity becomes more confusing because the original description of *S. plumieri* was based on a painting presented to Bloch by Pères Charles Plumier (Jordan & Evermann 1898). This brings further question as to the exact identity and number of scales present, and no indication can be determined at all concerning the morphology of upper jaw teeth. Based on all information available, and examination of specimens from varying localities, I can find no validity in maintaining the two species. Because *S. plumieri* was described almost a century before *S. antillarum,* and has been diagnosed on several occasions, including upper jaw teeth, the latter is considered a **junior synonym.**

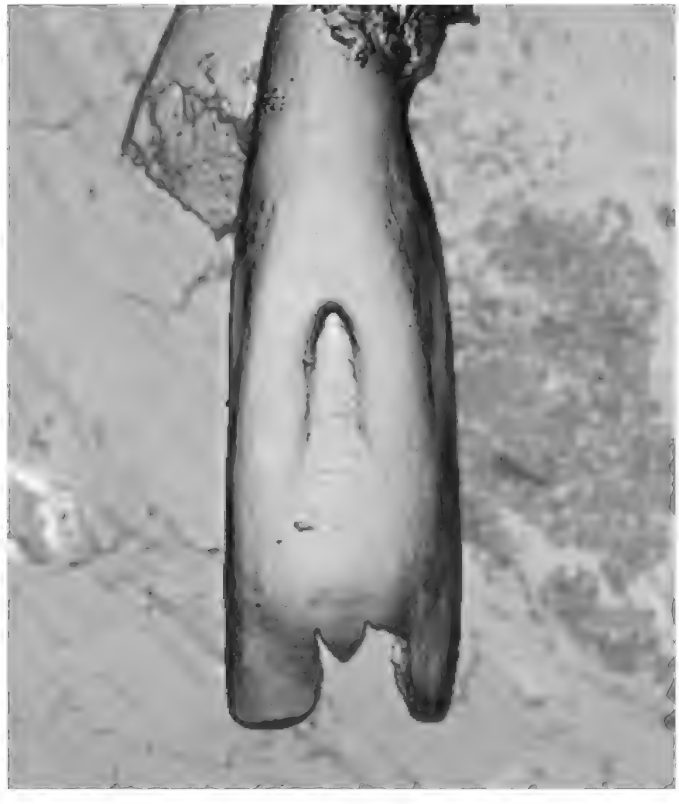


Fig. 14. Upper jaw tooth of *Sicydium punctatum,* SMNS 17318, female (73.3 mm SL); crown size of lest tooth 98.1 µm X 261.6 µm, right cusp partially broken away.

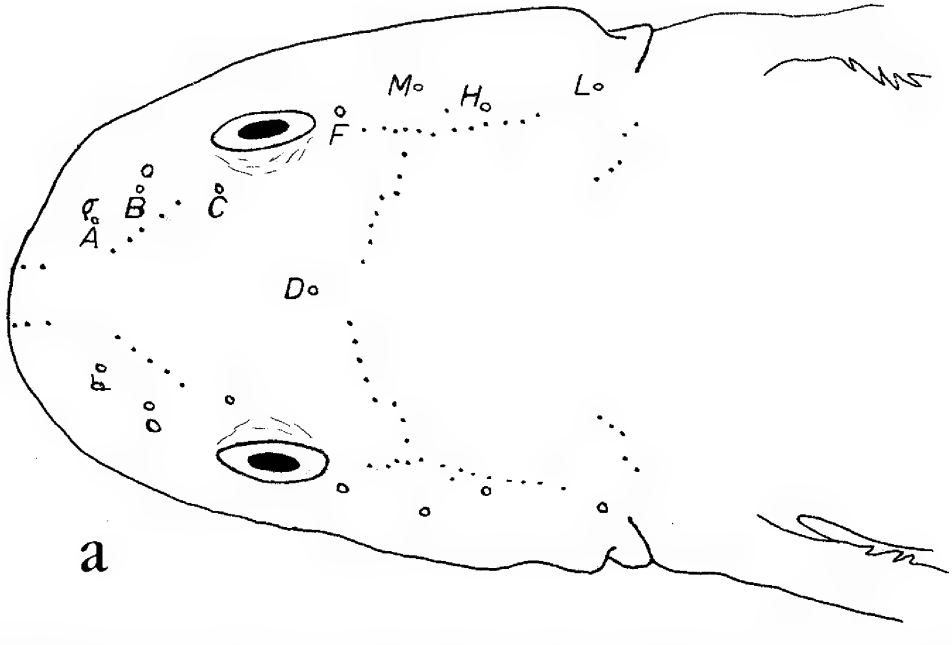
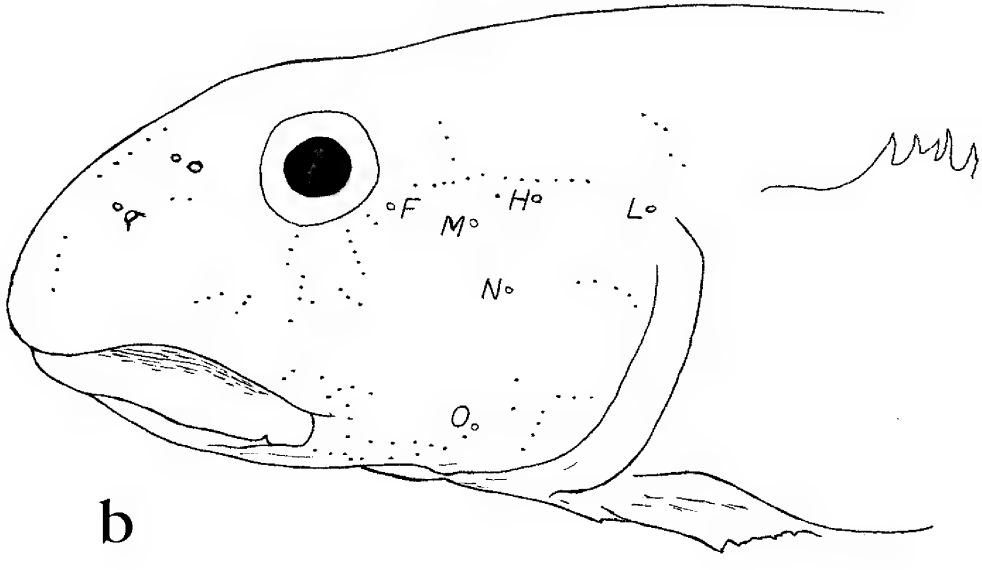


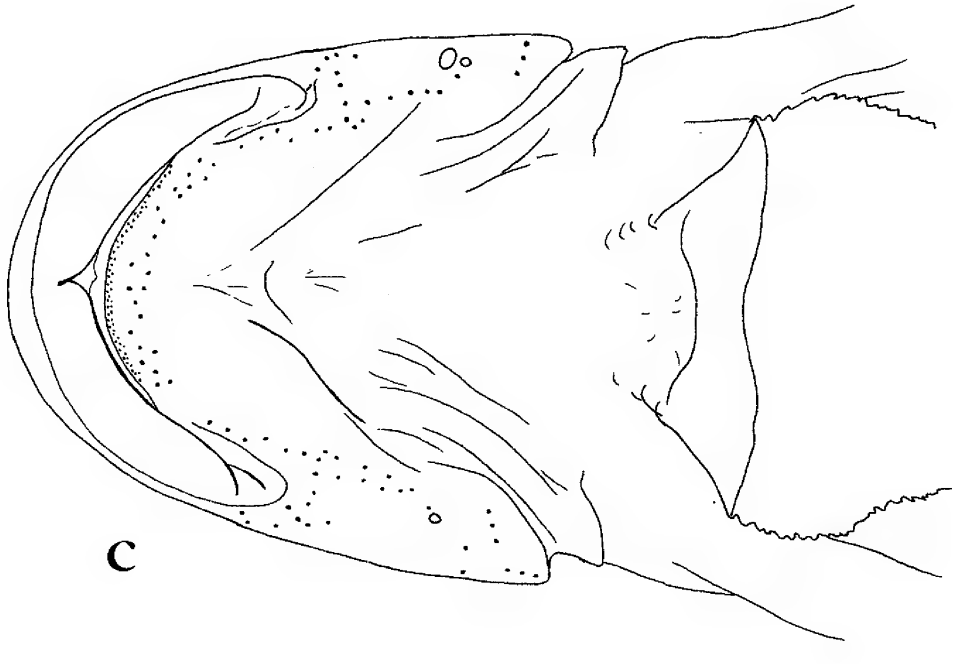
Fig. 15a–c. Head of *Sicydium punctatum* showing cephalic sensory pore system and cutaneous sensory papillae. – a. Dorsal view; b. lateral view (opposite); c. ventral view (opposite).

4.4. *Sicydium punctatum* Perugia, 1896

Spotted algae eating goby (Figs. 14–17)

Sicydium punctatum Perugia, 1896: 18 (type locality: Martinique; holotype: MSNG 6821 (Perugia, 1896).
Sicydium montanum Hubbs, 1920: 89 (type locality: Macuto, Caracas, Venezula; holotype: FMNH 9053) (Hubbs, 1920).
Gobiosoma thomasi Fowler, 1949: 1 (type locality: Río Grande, Portland Parish, Jamaica; holotype: ANSP 71841) (Fowler, 1949).





Material

116 specimens from the Dominican Republic, Puerto Rico, Trinidad-Tobago, Venezuela and Panama totalling 33 males, 53 females, 20 juveniles, 10 post larval fry, size range 18.9–73.3 mm SL, largest male 68.9, largest female 73.3, smallest gravid female 35.9.
Cuba. UF 10382, female (27.4). – UF 36605, juvenile (22.4).
Dominican Republic. NTM S. 13084-003, 2 females, 4 juveniles (23.4–39.2); Río Banilejo; 17 Mar. 1990, U. Schulz & H.-J. Troschel. – NTM S. 13085-004, female (35.9), Río Nizao; 18 Mar. 1990, U. Schulz & H.-J. Troschel. – SMNS 17313, 3 juveniles (18.9–24.2); Río Bajabonico at Imbert, 35 km NW Santiago; 1 Mar. 1990, U. Schulz & H.-J. Troschel. – SMNS 17314, 9 males, 12 females, 4 juveniles (21.9–38.2); Río Baonico, 20 m from mouth, 1.5 km NW La Cienaga, 15 km S Barahona; 13 Mar. 1990, U. Schulz & H.-J. Troschel. – SMNS 17315, 3 males, 4 females, 6 juveniles (20.2–35.3); Río Nazaito, 300 m from mouth, 100 m N Paraiso, 25 km SSW Barahona; 13 Mar. 1990, U. Schulz & H.-J. Troschel. – SMNS 17316, 1 male, 7 females, 1 juvenile (22.4–42.8); small brook entering Monte Río, near mouth, 5 km SSW Azua, 80 km W Santo Domingo; 16 Mar. 1990, U. Schulz & H.-J. Troschel. – SMNS 17317, 4 males, 9 females, 1 juvenile (23.1–50.8); Río Banilejo into Río Ocoa, WNW San José de Ocoa, 55 km W Santo Domingo; 17 Mar. 1990, U. Schulz & H.-J. Troschel. – SMNS 17318, female (73.3); Río Nagua, 9 km ENE San Francisco Macoris; 23 Feb. 1990, U. Schulz & H.-J. Troschel. – UF 101800, male (37.9); Provincia Barahona; 13 Mar. 1990, U. Schulz & H.-J. Troschel. – UF 101801, 1 male, 1 female (26.1–32.2); Provincia Barahona; 13 Mar. 1990, U. Schulz & H.-J. Troschel. – UF 101802, 2 females (37.6–38.8); Provincia Azue; 16 Mar. 1990, U. Schulz & H.-J. Troschel.
Martinique. INP.ENSAT uncat., 1 male, 5 females (30.9–57.1); rivière Capot at Vive; Oct. 1996, INP.ENSAT.
Panama. UF 64783, 9 males, 3 females (25.9–47.3); San Blas; 3 May 1965, Brockmann & Kupfer.
Puerto Rico. UF 7295, 10 post larval fry (13.9–17.4); Anasco; 15 Nov. 1955, Erdman & Zalduondo. – UF 64784, 2 males, 2 females (60.4–68.9); Humacao: tributary of Río Blanco crossing Route 191 north of Florida.
Trinidad and Tobago. UF 74898, 2 males, 1 female (35.9–36.6); Tobago; 7 Jun. 1973, J. Farr. – UF 74899, juvenile (21.0); Trinidad; 24 Jun. 1973, J. Farr.
Venezuela. SMF uncat., 2 females (44.6–61.5); Delta Amacuro; Apr. 1991, H. Bleher.

Diagnosis

Upper jaw teeth tricuspid, lateral cusps rounded, medial cusp pointed, anterior aspect of all teeth facing forward. Preopercular pores almost always M and O, pore N almost always absent. Predorsal midline mostly naked with few scales anterior to first dorsal fin. Belly usually naked, few cycloid scales may be present close to anus. Scales in zigzag series usually 12–13 (range 11–15).

Redescription

D always VI-I, 10, spines 3 and 4 filamentous in males. A I, 10, directly opposite to D2. P usually 18, 19 or 21 (range 17–22), usually lowest 2 or 3 rays simple (range 1–3), posterior margin rounded. C usually 13 (range 11–15), posterior margin rounded. LS usually 52–55 (range 47–62), most scales ctenoid extending to D2 and A, posterior to hypural base usually cycloid, may be with a single ctenoid scale. TRB usually 17–19 (range 15–22). TRF variable ranging 15–32, small individuals with fewer scales than adults. PD with 0–20 cycloid scales, naked anteriorly, seldom entirely naked. Belly usually naked, may be few cycloid scales close to anus. ZZ usually 12–13 (range 11–15). Head, breast and pectoral base naked. Upper jaw teeth entirely tricuspid, outer cusps rounded, central cusp pointed and smaller than those laterally with heavy dental reinforcement at base of all 3 cusps, number of teeth tend to increase with size of individual (range 31–60), anterior aspect of all teeth facing

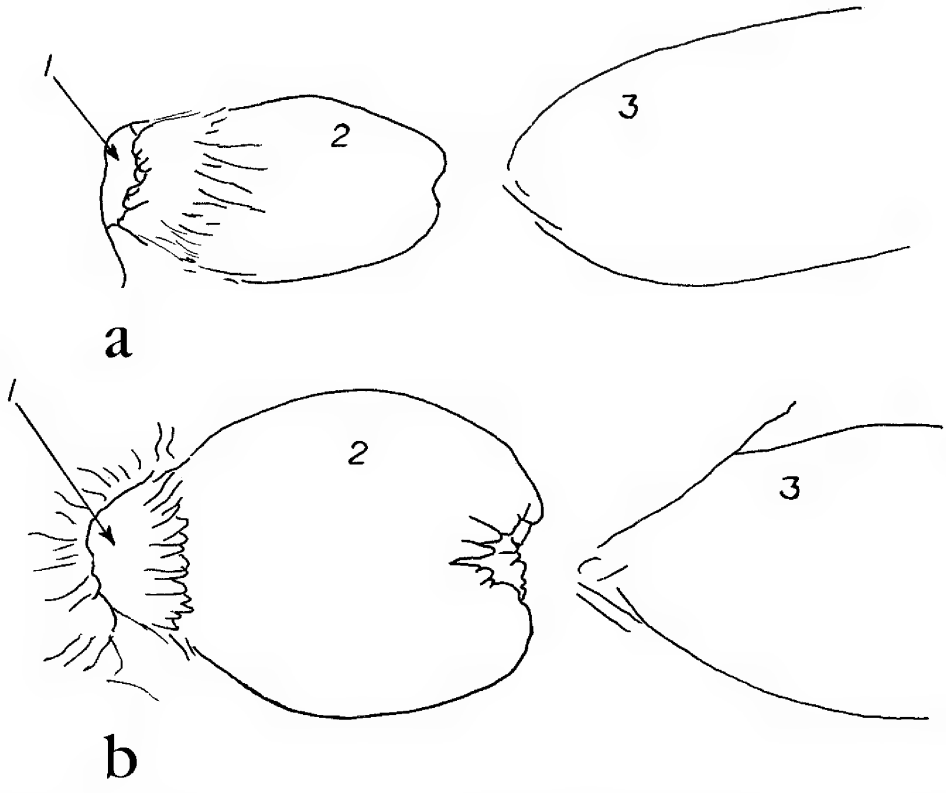


Fig. 16a–b. Urogenital papilla of *Sicydium punctatum.* – a. Male; b. female, *1.* anus; *2.* urogenital papilla; *3.* anal fin.

forward. Lower jaw teeth canine, always present, number of teeth tend to increase with size of individual, males usually 2–4 (range 1–7), females usually 5 (range 1–8). Gum between upper jaw teeth slightly finger-like extending from one third to one half length of crown. Cephalic sensory pore system A, B, C, D, F, H, L, M and O, pore D singular, all others paired, pore N seldom present. Cutaneous sensory papillae well developed on head.

Color in preservation: Almost identical to *S. buscki,* except markings over body and fins much more distinct. Most scales blackish laterally, appearing as spots. Males tend to be more dusky than females.

Color in life: Markings like those in preservation with varying shades of green. Bars laterally appear 'V' shaped and tend to be bluish with scale spots marginated in green. Body ventrally whitish to silvery. Head greenish above and bluish below. Dorsal fins with blackish blue rays and spines, membrane greenish. Caudal fin greenish with upper posterior margin bright green. Anal fin greenish. Pelvic disk whitish. Pectoral fin mostly transparent with a greenish pectoral base. Color in males much more intense than females with lighter colors tending to be highly reflective, some colors may appear as bright, reflective emerald green. Intensity of colors in both sexes can be quite spectacular.

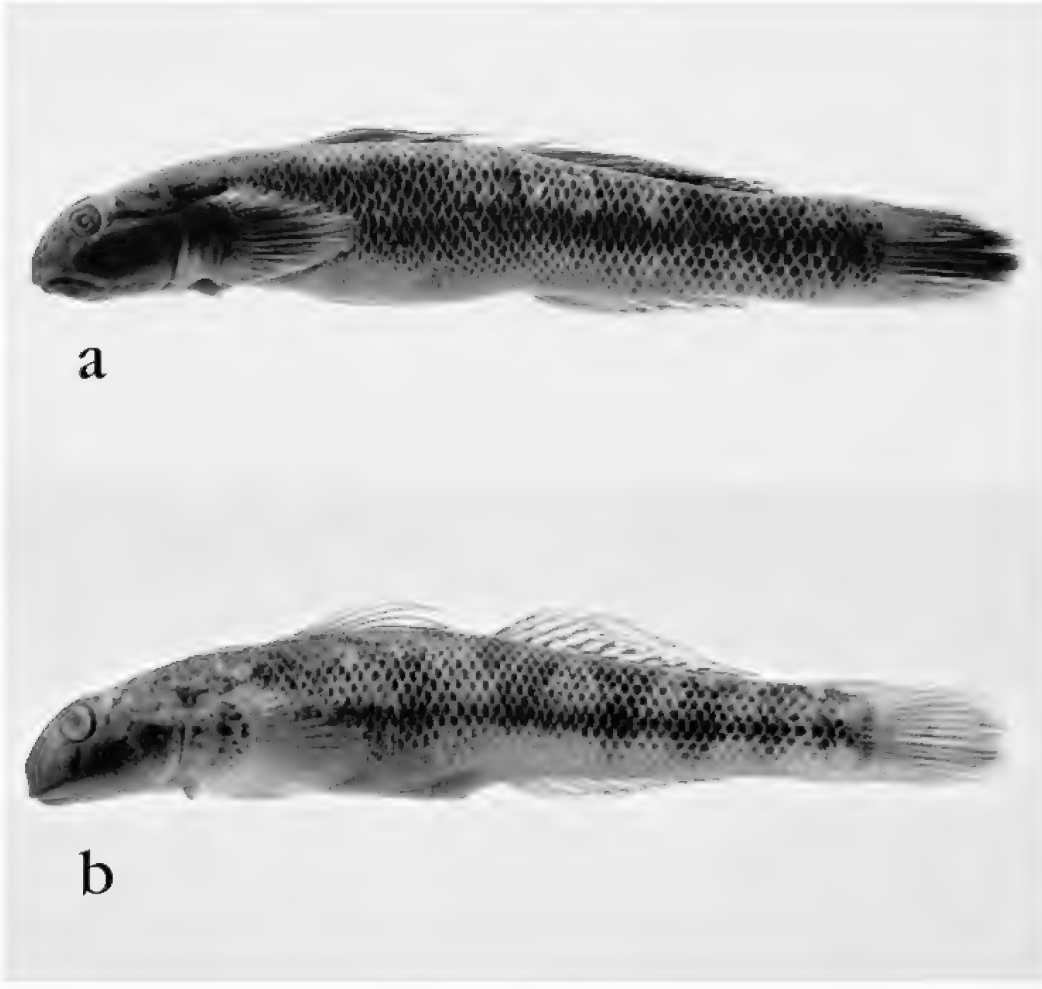


Fig. 17a–b. *Sicydium punctatum.* – a. SMNS 17317, male (41.2 mm SL); b. SMNS 17318, female (73.3 mm SL).

Distribution

Known throughout the Greater and Lesser Antilles, Venezuela and Caribbean slope streams of Panama, but has not been reported from Colombia.

Remarks

In *S. punctatum* the number of pectoral rays is confusing. *Sicydium punctatum* from the Greater Antilles usually has 18, 19 or 21 rays, seldom 20. From Panama, Venezuela, Trinidad and Martinique the number of pectoral rays are almost always 18. This suggests two distinct forms existed in the past with the continental form usually having 18 rays and the Greater Antilles form usually with 21. Since island building the continental form has colonized the Lesser Antilles and is a recent arrival in the Greater Antilles where mixing of the two forms has resulted in unusual pectoral ray counts.

Specimens from Delta Amacuro, Venezuela were collected as post larval fry and tank raised for over a year.

Table 3. Scale counts in species of *Sicydium* known from the Dominican Republic.

Lateral series

	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74
S. buscksi			2	-	4	2	8	10	23	21	34	32	18	23	12	9	8	1	-	2	1	-	-	-	1			
S. gilberti										1	-	2	3	5	10	9	3	8	6	2	3	1	-	-	-	1		
S. plumieri												4	3	4	7	20	26	22	25	23	25	12	3	9	4	1	-	1
S. punctatum		1	3	4	4	4	10	15	9	10	5	3	4	2	-	-	1											

Transverse back series

	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
S. buscksi		2	7	26	44	60	49	18	2	4	1	2					
S. gilberti					1	1	3	7	7	11	12	8	2	-	1		
S. plumieri						2	5	12	31	44	47	17	17	7	2	5	1
S. punctatum	1	8	17	18	20	8	3	1									

Transverse forward series

	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
S. buscksi		5	10	10	14	19	19	33	25	17	19	19	10	5	3	2	-	-	-	-	-	1										
S. gilberti					1	-	1	1	-	1	3	2	3	3	5	1	3	2	5	3	4	6	3	4	2	-	1					
S. plumieri								1	-	1	1	1	3	5	5	6	9	11	10	19	17	19	16	15	15	8	6	9	4	2	2	1
S. punctatum	1	3	5	12	9	10	10	6	4	8	2	2	2	2	-	1	-	1														

Predorsal series

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
S. buscksi	11	2	16	9	20	12	22	16	19	31	19	15	6	5	6	1	3	-	-	1												
S. gilberti															1	3	1	2	2	4	2	7	11	5	6	7						
S. plumieri											1	-	1	-	1	1	2	4	6	12	11	19	19	33	34	19	14	8	3	1	-	2
S. punctatum	9	-	3	3	-	3	5	4	3	5	7	11	6	5	2	3	1	4	2	1	3											

Zigzag series

	11	12	13	14	15	16	17	18	19	20	21	22	23	24
S. buscksi		2	23	90	52	33	11	1						
S. gilberti				1	-	4	6	15	11	10	6	1		
S. plumieri						2	11	22	38	54	39	17	2	3
S. punctatum	1	26	21	15	11									

Table 4. Morphometric in species of *Sicydium* known from the Dominican Republic expressed to the nearest whole percent of standard length.

Predorsal length

	30	31	32	33	34	35	36	37	38	39	40	41	42	43
S. buscki ♂♂			2	6	33	28	20	2	2					
S. buscki ♀♀				3	11	40	34	21	6	2	1			
S. gilberti ♂♂					3	1	1							
S. gilberti ♀♀						2	11	11	5	3				
S. plumieri ♂♂				7	12	36	28	7	4					
S. plumieri ♀♀					1	13	26	32	15	2	1	–	–	1
S. punctatum ♂♂	1	1	2	2	5	10	3	2	2					
S. punctatum ♀♀			1	4	6	14	13	4	1	–	1			

Preanal length

	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65
S. buscki ♂♂					1	–	2	8	22	28	20	8	4					
S. buscki ♀♀								2	6	15	21	29	30	6	5	2	1	1
S. gilberti ♂♂							2	1	–	–	2							
S. gilberti ♀♀									6	12	7	3	2	1				
S. plumieri ♂♂				1	2	–	11	18	32	21	6	–	1					
S. plumieri ♀♀						1	1	5	10	21	27	17	13	2				
S. punctatum ♂♂	1	–	–	–	–	1	2	6	6	6	3							
S. punctatum ♀♀								1	3	8	5	17	5	4	2			

Head length

	17	18	19	20	21	22	23	24	25	26
S. buscksi	1	–	1	11	55	72	53	15	5	2
S. gilberti					9	11	10	3		
S. plumieri			1	–	18	50	59	26	9	2
S. punctatum				3	14	28	14	6	4	2

Upper jaw length

	8	9	10	11	12	13	14	15	16	17	18
S. buscksi		34	107	58	8						
S. gilberti			7	19	26	4	1				
S. plumieri			2	21	64	64	26	3	5	3	1
S. punctatum	3	16	30	13	6	2	1				

Caudal peduncle length

	16	17	18	19	20	21	22	23	24
S. buscksi	2	13	50	72	50	21	1	–	1
S. gilberti		2	10	22	6	5			
S. plumieri	2	28	87	51	13	5			
S. punctatum	2	9	17	14	13	14	1	–	1

Caudal peduncle depth

	9	10	11	12	13	14	15
S. buscksi		1	2	19	103	77	8
S. gilberti		1	1	5	18	12	
S. plumieri		1	11	50	88	34	3
S. punctatum	1	3	24	31	12		

Table 4 (continued)

Body depth at second dorsal origin in males

	15	16	17	18	19	20
S. buscksi	3	17	42	20	9	
S. gilberti			1	3	–	1
S. plumieri		11	27	42	10	6
S. punctatum	5	7	8	6		

Second dorsal fin length

	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
S. buscki ♂♂					2	3	6	4	5	10	6	13	9	16	10	3	3	3								
S. buscki ♀♀	2	5	28	35	24	15	4	1	2	1																
S. gilberti ♂♂									1	–	1	1	–	–	–	–	–	1	–	–	1					
S. gilberti ♀♀					8	8	10	4	1																	
S. plumieri ♂♂						3	2	2	–	4	7	4	4	4	4	12	5	6	7	9	8	3	3	1	4	1
S. plumieri ♀♀			1	2	3	5	21	18	13	14	6	2	2	2	1	1										
S. punctatum ♂♂				1	2	4	2	1	2	3	1	2	2	1	1	1	–	1	1							
S. punctatum ♀♀	1	–	6	–	7	6	7	7	7	2	1	2														

Anal fin length

	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
S. buscki ♂♂						3	4	7	9	19	19	21	8	3	1					
S. buscki ♀♀	2	–	5	28	37	24	12	6	3											
S. gilberti ♂♂								1	–	1	–	–	1	1	–	1				
S. gilberti ♀♀					4	9	10	8	–	1										
S. plumieri ♂♂							3	2	3	4	8	11	6	9	17	17	9	5	2	1
S. plumieri ♀♀					3	15	24	28	12	4	4	1								
S. punctatum ♂♂						3	2	4	1	6	2	1	6	–	–	–	1			
S. punctatum ♀♀					5	2	7	10	9	6	5	–	1							

Caudal fin length

	18	19	20	21	22	23	24	25	26	27	28
S. buscki ♂♂	1	1	5	13	26	19	22	6			
S. buscki ♀♀	1	10	34	43	19	8	–	1			
S. gilberti ♂♂					1	–	2	2			
S. gilberti ♀♀		2	3	8	13	4	1				
S. plumieri ♂♂			1	10	9	12	19	20	18	4	4
S. plumieri ♀♀		6	9	28	33	11	4	1			
S. punctatum ♂♂	1	–	1	4	2	6	7	3	1		
S. punctatum ♀♀			2	6	9	11	9	8	1		

5. Conclusions

Though this report may help to clear misconceptions and misinformation pertaining to morphological characteristics and numbers of species from the Dominican Republic, a much more thorough review of *Sicydium* is needed.

Unlike conclusions that state only one species of *Sicydium* is present on Puerto Rico (Hildebrand, 1935; Erdman, 1961, 1986), this study found all four species present. Interestingly all four species had been collected on Puerto Rico by D. S. Erdman.

More than a decade has gone by since SPRINGER (1982) published his work on the biogeography of the Pacific Plate. Little else has been presented concerning zoogography relative to other tectonic plates. *Sicydium* from Neotropical waters are Caribbean Plate endemics with peripheral distribution into Cuba, both slopes of Mexico and south to Peru on the Pacific slope. Post larval fry of *Sicydium punctatum* have been collected at the mouth of the Río Orinoco, Delta Amacuro, Venezuela, and is the only *Sicydium* known south of Trinidad, the southeastern limits of the Caribbean Plate. Interestingly similar distributions are known for *Awaous banana* Valenciennes, *Gobiomorus dormitor* Lacepède and *Gobionellus pseudofasciatus* Gilbert & Randall, to name a few. With adequate research biogeography will probably be correlated with other tectonic plates.

Little else is known concerning sicydiine gobies from the New World. A reliable source (BLEHER, personal communication, 1993) placed a small sicydiine goby in the upper Amazon Basin of Peru, but has not been collected. Exactly what the genus is remains unknown.

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Author's address:

Dr. RONALD E. WATSON, 3658 NW 41st Lane, Gainesville, Florida 32605-1468, U.S.A.

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